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Hog Selection and Culling

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Pigs to Pork

SELECTION

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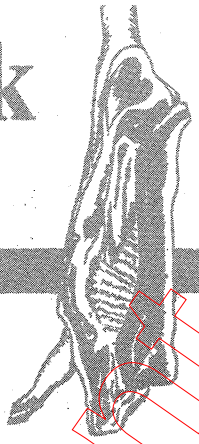

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Swine differ from other farm animals in several respects.

1. They are litter-bearing animals as contrasted to twinning in sheep or single births in cattle and horses.

2. Meat is their primary product of usefulness. They don't provide power or produce fiber, milk or eggs for human use.

3. Their lactation period is shorter and by comparison may well have less total effect on market weight than is the case with cattle and sheep.

These differences suggest that swine improvement, through breeding, selection and culling, will differ in some respects from other animals.

Classification of Traits

Swine traits can be classified into three general groups: (1) structural, (2) productive, and (3) reproductive.

The structural traits include carcass characteristics such as fatness, muscle size, carcass length and mature body size. These traits are highly to medium-highly heritable and can be improved fairly rapidly by selection.

The productive traits include rate of gain, feed efficiency and milk production. Researchers show that these have intermediate heritability--thus, they can be improved at a moderate rate by selection.

The reproductive group includes litter size at birth and litter size at weaning. The number farrowed is determined by the number of eggs shed, then by the number fertilized and finally, by the survival rate during development. Environmental factors, such as management practices, and the physiological or health status of the animal have a tremendous effect on these reproductive traits; hence, they are lowly heritable. However, they do show the greatest response of any of the groups to crossing, where the sow herself is a crossbred. (In general, the lower the heritability, the greater is the response of crossing.) The heritability estimate for the number of eggs shed hasn't been determined. Believing this to be high, many recommend that caution be exercised against disregarding the reproductive traits when making selections of replacements for the breeding herd.

Table 1 contains heritability estimates from many studies, as summarized by Dr. W. A. Craft, Regional Swine Breeding Laboratory, Ames, Iowa.

Selection

A breeder's ultimate success depends upon his skill in selecting and mating animals. Selection is one of the most powerful tools in

Table 1. Estimates of heritability of swine traits, based on reports of investigations from many breeds and several countries a/

Trait	Heritability	
	Range	Approximate average
	percent	
Structural traits		
Length of legs	51-75	65
Number of vertebrae	---	74
Conformation scores	10-35	29
Type, within herds of similar type		38
Type, between herds of small, intermediate, and large type (Poland China)	---	92
Length of carcass	40-81	59
Loin eye area	16-79	48
Thickness of backfat	12-80	49
Thickness of belly	39-72	52
% of carcass weight:		
loin	51-65	58
shoulder	38-56	47
fat cuts	52-69	63
lean cuts	14-76	31 b/
Productive traits		
Weight of pig at 5-6 months	3-66	30
Growth rate (weaning to 180-200 lb.)	14-58	29
Economy of gain	8-72	31
Reproductive traits		
Number of pigs farrowed	3-24	15c/
Number of pigs weaned	3-32	12c/

a/ Craft, W. A., 1958. Fifty years of progress in swine breeding. J. An. Sci. Vol. 17p.960.
b/ Probably low.
c/ Probably high.

the hands of the breeder of animals and plants. The use of selection extends as far back as records go in the history of breeding. Selection is merely the choosing of some hogs as breeders and sending others to slaughter.

Selection is of two general kinds which, in principle, are really the same.

Natural Selection allows certain genetic combinations in hogs (as with other animals) to be preserved because the boars and sows possessing them are better able to survive through the reproductive period, better able to secure food, more adept at escaping or combating enemies and better able to procure mates. The fittest survive.

Artificial Selection preserves certain genetic combinations of heritable characteristics because they please the breeder or contribute to his well being. It has been rec-

ognized for decades that artificial selection may be based on any one or a combination of the following: 1) individuality, or phenotype, 2) ancestry or pedigree, and 3) progeny-- 1) is the hog's appearance; 2) indicates what the immediate ancestors were like in appearance and performance; and 3) tells the breeder what the offspring of this hog looked like and how they performed.

How fast these traits improve depends on on the degree of heritability of each trait. Structural traits--conformation and carcass characteristics--can be improved quite rapidly. Productive traits--rate and efficiency of gain--can be improved moderatly fast. Reproductive traits--larger litters-- will be very slow to show improvement. But, if one parent, for example the purchased boar, is much superior to the other, then more improvement will be noted in the offspring.

Selection Methods

A number of methods may be used to determine which animals to save for replacements. The three most commonly used are the "tandem" method, "independent culling levels" and the "selection index."

The tandem method selects for one characteristic at a time until it is improved, then for a second characteristic, later for a third, until finally each has been improved to the desired level. The disadvantage of this method of selection is that while improvement is being made in one trait, the others may deteriorate.

Independent culling levels is a more desirable selection method because a floor is set for each trait to be improved. Any animal falling below this minimum standard is culled regardless of how good the other traits may be, thus maintaining selected improvement. An example of this is the all breed certification standards adopted by the National Association of Swine Records. By using this method more than one trait is improved at a time and overall improvement is considerably faster than in the tandem method.

The selection index can be the most efficient method of selection yet devised. A selection index describes the genetic worth of each animal with a single numerical value. This numerical value is determined by the economic importance and the heritability of each trait. The index permits unusually high merit in one characteristic to make up for slight deficiencies in another. The chief advantage of the selection index is that it emphasizes traits of high economic importance and heritability and provides an objective basis of comparing individuals.

It, too, has disadvantages. It is difficult to assign economic or relative values and to compute the index. Furthermore, some animals must be culled without regard to the index because of some important functional defect. Culling for gross functional faults, such as only eight teats, must be practiced when using the selection index or any other method.

In selecting replacements in the breeding herd, much emphasis must be placed on selecting sires. They directly affect larger numbers of offspring than do the dams. In fact in a one-boar sized herd, he is responsible for half of the inheritance of the entire crop

of pigs. For this reason a mistake in his selection can greatly handicap the breeding program.

When selecting boars and gilts for the breeding herd, it is well to combine desired type and the selection index. When feasible, setting some independent culling level before imposing the selection index will lead to more ideal selections. It is well to select 1 1/2 to 2 times the number needed on the basis of their index, then, from this group re-select on the basis of their breed type and consistency of performance of their family lines. Although the greatest theoretical progress is not made by combining type considerations, independent culling levels and selection indices as bases of selection, progress will be made. And, efficient production of the desired type of hog for purebred or commercial purposes will be realized.

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